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Directorate General for Research-Directorate A

STOA - Scientific and Technological Options Assessment

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## Multilinguality and the Internet

### Introduction

This STOA briefing looks at multilingualism and new information technologies (especially Internet-based applications).

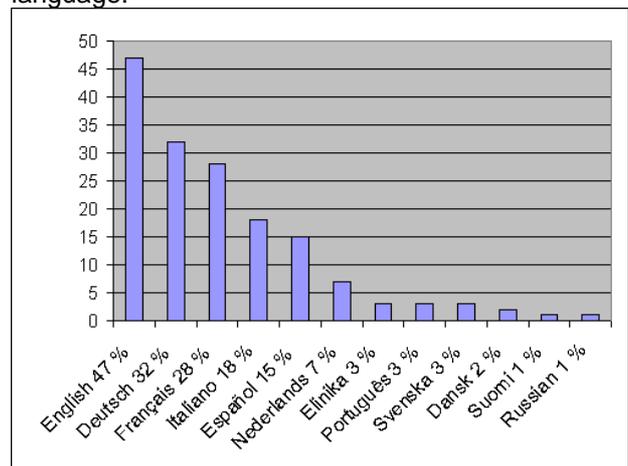
- EU enlargement will lead to an increase in the number of European Union languages. Preserving linguistic diversity arguably can help to develop **tolerance** and **understanding** among people from different linguistic and cultural backgrounds. Promoting multilinguality can also play a role in:
  1. Creating better job prospects;
  2. Allowing active participation in regional, national and European democratic processes.
  3. Assuring the right of EU citizens to live and work anywhere in the Union.
- The EU programme "**The User-friendly Information Society (1998-2002)**" covers a series of specific actions, all focusing on the development of technologies and providing the necessary link between research and political action in order to build an **information society which is coherent and universally accessible**. The programme aims to provide systems and services for the public; new methods of work; multimedia content and tools; essential technologies and infrastructures; research and technological development activities of a generic nature and support for research infrastructure. These new strategic goals aim to make the European Union a more competitive and dynamic knowledge-based economy, both by accelerating the creation of a **reliable information society** and **ensuring that the needs of citizens and businesses are met**.
- Within the Programme, a report "**Human Language Technologies (HLT)**" pays particular attention to Multimedia Content and Language Technologies which promote truly "human" technologies which ensure equal access and usage for all. HLTs are meant to

enhance **cost-effective interchanges across language and culture**, provide a **natural interface** to digital services and **more intuitive assimilation and use of digital content**.

### The European Linguistic Heritage

One of Europe's richest assets is its great variety of languages. With its 45 national and regional languages spoken by 380 million people, Europe represents one of the most significant examples of a multilingual "community". Most of its languages are of Romance, Germanic or Celtic origin, others include Greek, Finnish or Basque.

In comparison with other areas of the world, Europe's language diversity is modest: globally, estimates of the number of different spoken languages vary from 5.000 to 25.000 depending on what counts as a language and what as a dialect. The following table shows the proportion of European citizens speaking each language:



- English is the most widely "spoken" language in the EU. It is the mother tongue for 17% of the European population, but a further 31% of the EU citizens speak it well enough to hold a conversation, an even higher proportion can read it;
- German is the mother tongue for 24% of the EU's citizens and spoken well "enough" as a "second" language by 8% of EU citizens;

- French is the mother-tongue for 15% of the EU and is understood by a total of 28% of EU citizens.
- Italian is the fourth most widely known language. Although it counts as many native speakers as French, the proportion of non-native speakers is significantly smaller (2%);
- Spanish is spoken by 15% of the EU population (11% as mother tongue and 4% as a foreign language);

As a matter of fact, we could conclude that half of Europe is already multilingual:

- 45% of EU citizens can take part in a conversation in a language other than their mother tongue;
- in some countries (i.e. Luxembourg, Netherlands, Denmark and Sweden) nearly everyone speaks another foreign language fluently;

In addition, there are the existing linguistic minorities of the member countries:

- Small minorities of *Slovene*, *Croat*, and *Hungarian* speakers live in the South of **Austria**; Slovenian minorities are also found in the north-east of Italy (Friuli Venezia Giulia).
- *German speakers* are found in Belgium (in the Provinces of Luxembourg and Liege, where, since 1973, the Cultural Council for the Eastern Cantons has been created to preserve their linguistic peculiarity), **Denmark** (in the region of Slesvog, where they created the Bund Deutscher Nordschleswiger to protect their rights), **France** (in Alsace and Lorraine), **Italy** (in almost all the northern regions such as Alto Adige, Friuli, Valle d'Aosta, Trentino, Piemonte, Veneto; since 1964 a package of safeguard measures has been adopted to give parity status to Italian and German languages and fixing ethnic quotas for public administration personnel).
- *Swedish minorities* live in **Finland** on the Western coasts and on the Aland Islands, where since 1919 this minority has been considered as equal to Finnish by the Constitution and is represented in Finland by a Consultative Assembly. However the use of Swedish is tending to disappear.
- *Sami* live in northern **Finland** and **Sweden**, where in 1945 the Salskapet Same-Atnam has been created to promote and protect their cultural and linguistic identity (i.e. it provided a standard orthography for the seven linguistic groups of the Lapp language.)
- *Frisian-speaking minorities* live in **Germany** (since 1949 the Nord Frijsk Association has been working to promote the use of Frisian) and in the **Netherlands** (they live in the Province of Friesland, where in 1844 the

Society for the Frisian Language and Literature was created.

- A *Polish-speaking minority* lives in **Germany**, especially in Westphalia and in the Ruhr area.
- A *Turkish-language minority* is found in **Greece**. There are also other smaller minorities living in Greece such as *Bulgarians*, *Armenians*, *Macedonians*, *Aromuns* and *Albanians*
- A *Gaelic-speaking minority* live in **Ireland**. After Irish independence, the national Constitution acknowledged Gaelic as the official language.

In some other EU member states the language and cultural minorities situation is even more diversified:

- **Italy**: A *French-Provençal minority* lives in the North-west and in smaller communities in the South, but the Italian government recognises administrative and linguistic autonomy only to the communities located in Val d'Aosta; A *Walsers minority* is located mainly in Val d'Aosta and speak a variety of German dialects; *Ladins* live in the Dolomites area, government initiatives have been undertaken to preserve their linguistic and cultural diversity; *Albanian-speakers* are found in the South of Italy; *Greek-speakers* are found in a large area of Southern Italy; *Sardinians* live in the Italian island with the same name and speak a neo-Latin dialect. In 1981 the language was recognised as legally equal to Italian and the region was declared bilingual; a *Catalan speaking minority* is also located in the South of Sardinia (Province of Alghero); a *Croatian speaking minority* exists in Molise since the XV-XVI century speaking an archaic dialect.
- **Spain**: the *Galicians* obtained large administrative autonomy for their region (Galicia) and in 1983 the acknowledgement of "Gallego" as a national language of Spain; the *Basques* speak a language called Euskara, recognised as a national language in 1981; the *Catalans* are the 6 million inhabitants of Catalunya, but their language is also spoken in Valencia, in the Balears Islands in the "Franja de Ponent" (belonging from the administrative point of view to Aragona), in Roussillon (France), Alghero (Sardinia) and in Andorra; the *Aranesis* live in the Aran Valley in the Pyrennees, they speak a Gascon dialect and since 1990 regional and national laws allow the official use of "Aranès" and the teaching in local schools; the *Gitanos*, situated in the towns in Andalusia, speak 'Kalo', a language with a Spanish grammar basis and lexical elements of Gypsy origins.
- **United Kingdom**: *Cornish* is a Celtic language similar to Welsh and Breton. It is now not generally in use, though there are attempts to preserve it. *Manx* is a similar Celtic language

used on the Isle of Man, however interest in the language is limited because only 35% of the population have local origins; *Welsh* is spoken chiefly in North Wales. It almost became extinct in the 19<sup>th</sup> century, but overt attempts to suppress it led to a revival of the language which has been an official language of Wales and is taught in schools since 1982. Radio and television has broadcast in Welsh since 1982.

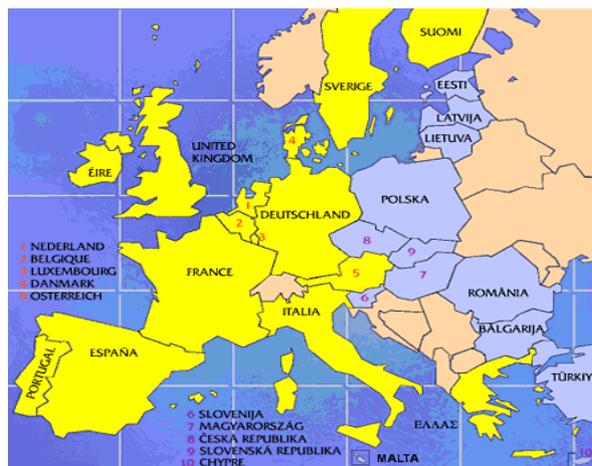
### Linguistic diversity in the candidate Member States

The process of enlargement to include central and eastern Europe, Cyprus and Malta represents an historical undertaking for the European Union.

The enlargement of the European Union will result in growth of European official languages, raising the problem of how to manage this increasing multilinguality and to promote cultural and linguistic diversity as well.

Focusing on the linguistic heritage of the forthcoming countries, it is possible to identify the following tongues:

- **Bulgaria:** the language used for all administrative purposes is *Bulgarian*, written in the Cyrillic alphabet: there is also a Turkish-speaking minority, representing ten per cent of the population. The country has one of the highest concentrations of Romany-speakers (400,000).
- **Cyprus:** officially the two languages of Cyprus are *Greek* (81.6%) and *Turkish* (18.4%)., representing the two major communities of the island. At present, due to the Turkish invasion of 1974 only two-thirds of the island is now controlled by the greek-speaking Cyprus government, with the remaining one-third being turkish-speaking.
- **Czech Republic:** the official language is *Czech*, it is used for all administrative purposes. There is a small minority (possibly three per cent) of Slovak speakers ( the *Czech* and *Slovak* languages are closely related).
- **Estonia:** *Estonian* represents the first language for 61.5% of the total population. There is also a Russian-speaking minority, consisting mainly of ethnic Russians who settled in Estonia when it was still a part of the Soviet Union.
- **Hungary:** Hungarian is the official language used throughout Hungary. There are also small minorities of German-, Croat-, Slovene- and Romany-speakers, but there is no protection of language rights for these languages.
- **Latvia:** the Republic of Latvia is the Baltic State which attracted the greatest proportion of settlement of ethnic Russians during the 50 years of Soviet rule. Nowadays Russian speakers represent one third of the population:



education is in Latvian and Russian. Small minorities of Belarussian, Ukrainian and Polish speakers also live in Latvia.

- **Lithuania:** the use of the Lithuanian language is assured in the activities of state and public bodies, educational, cultural, scientific, industrial and other institutions, enterprises and organisations. Lithuanian-speakers make up 80% of the population, with considerable Russian (8%) and Polish (7%) speaking minorities, and smaller Belarussian and Ukrainian minorities.
- **Poland:** Polish is the official language and is used for all administrative purposes: modern Poland includes some speakers of other languages. (German, Ukrainian, Belarussian and Romanian). However all the minority language speakers are bilingual (their own language and Polish).
- **Romania:** Romanian is the official language used for all administrative purposes: the largest language minority is Hungarian and is mainly concentrated in the areas close to Hungary.
- **Slovakia:** the official language is *Slovak*, which is a Slav language. Due to the natural cultural influence of neighboring nations, the language spoken in frontier regions shades into Czech, Hungarian, Ruthenian and Polish. However, all dialects of Slovak are mutually comprehensible, for there are no sharp linguistic frontiers.
- **Slovenia:** *Slovene* is the official language of Slovenia and is spoken by the vast majority of the population. There are small Hungarian and Italian-speaking minorities and an effort has been made to provide language services in these languages in localities where they are strongly represented.

### **Promoting multilinguality on the web: the relevance of Human Language Technologies**

The preservation of the various languages in Europe is primarily a task for the countries concerned: inspired by the wishes of its citizens, each member state and region places a special value on its language, insisting on their continued recognition in the European context.

All Member States and regions thus have a common interest in preserving language diversity in the European Union as it enters the information age.

The information society is global, and globalisation is one of the properties characterising the new economy. **Communications take therefore place in a space that is a priori multilingual.** Tools supporting this multilingual communications are emerging. The time is ripe to assess their suitability for the task, identify needs that can be addressed in the medium term, and strategies for future developments.

Spoken and written human language is without doubt the most powerful and flexible means for expressing, communicating, recording and retrieving knowledge: society and business are bound by language, and yet language and its related cultural, cognitive and communicative features are difficult to master and exploit especially in today's increasingly digital and 'global' world.

The social impact of the Internet revolution and the related need for content products and services are significant: language diversity is one of the most relevant for three reasons:

1. The presentation of content in different languages promotes citizens' equal access to the information society;
2. Multilinguality on the web preserves, at the same time, linguistic diversity within the European Union.
3. The necessity of linguistic and cultural customisation opens export markets for further exploitation by the content industry.

Furthermore the social impact of the Internet revolution could play an important role in the enlargement process: for potential new Member States access to the tools and resources of the information society is essential to help develop their economic and social potential. Content industries providing products and services in local languages will aid participation of the potential new Member States into the Information Society and can facilitate integration into the Union.

At present, about 70% of all content on the Internet is in English. However some estimates show that from a monolingual start (English) the global networks are slowly becoming characterised by the growth of a number of language areas that hardly

communicate with each other. From this point of view, efforts should be directed to ensure the widest adoption of tools scanning the whole horizon of information delivery and to that end commercial partnership between the digital content and the language industries providing the necessary tools and services are essential.

"Key Action 3" of the European **Fifth Framework Programme for Research and Technological Development** (1998-2002) aims to:

- improve the functionality, usability and acceptability of future information products and services;
- enable linguistic and cultural diversity;
- Stimulate creativity and enhance education and training systems for lifelong learning.

Among the KA3 domains, special focus has been given to **Human Language Technologies (HTL)**. The objective of HLT is to **enhance usability and accessibility of digital content** and services while **supporting linguistic diversity** in Europe.

This is to be achieved by developing and demonstrating multilingual technologies and exemplary applications critical for the realisation of a truly user-friendly information society.

HTL actions will address three areas centred around human interaction with information services and with each other in order to foster:

- **Multilinguality** in Digital Content and Services: the overall objective is to achieve higher information productivity and communication effectiveness in multilingual, cross-cultural environments by building multilingual intelligence, so as to enable Europe's diversity in the information age, increase its international competitiveness and sustain its excellence in the provision of multilingual systems and services, by transferring core language technologies to a wider set of languages.
- **Natural Interactivity**: the overall objective is to enhance the naturalness of interaction between humans and digital services and the easy use of computer systems.
- **Active content**: with a view to improving the effectiveness of information access and the efficiency of information handling by exploiting the linguistic knowledge embodied in documents, messages, database, records, dialogues and audio-visual objects.

### **The impact of Human Language Technologies in social and economic life**

Language engineering means finding ways of living comfortably with technology. People's knowledge of language can be used to develop systems that recognise speech and writing, understand text well enough to select information, translate between

different languages, and generate speech as well as the printed word.

By applying such technologies it is possible to extend the current limits of human use of language. Language-enabled products will become an essential and integral part of everyday life.

New technology combined with our knowledge of language will enable people to retain their national and cultural identities and appreciate the differences of others. At the same time they will be able to communicate more effectively and with greater sensitivity.

All cultural treasures, in libraries and museums across the European Union, will be made accessible to everybody, irrespective of linguistic boundaries.

Also from the economic point of view, language engineering will play a significant role:

1. To have the **right information** at the **right time** is surely vital to every industrialist, administrator and politician.
2. Being able to handle **export business** as well as **domestic customers** is crucial to developing new markets abroad.
3. Being able to use new technology more easily will improve **productivity** and **performance** in all walks of life.
4. **Helping the disabled** to integrate into all aspects of society will improve the quality of life for them and their families, as well as making more skills available to the community.
5. More **efficient translation services** will lead to better international understanding, at all levels.
6. **Greater availability of information** about other countries' goods and services, employment prospects, weather, and traffic conditions will expand people's horizons.

***Human Language Technologies and Internet: promoting multilinguality across Europe's content and communication system***

There is a common popular perception that the Internet is an exclusively English-language medium: this is understandable because of the early phenomenal growth in the USA. Estimates of Internet usage by language indicate that whereas there is a steadily increasing growth of usage in English-speaking countries, there is a greater rate of increase in other countries, particularly in Europe, China and Japan.

In July 1999 it has been estimated that 128 million people accessed the Internet in English, whereas 88 million accessed the Internet in other languages and by 2002 a majority of Internet users world-wide

will be non-English-speakers and three years later their proportion will have risen to 60%<sup>2</sup>.

Global communication on Internet is therefore going to have to take account of linguistic diversity, and global e-commerce is going to have to resort increasingly to multilingual presentation and management of information, and therefore to translation: where information retrieval and text summarisation is concerned, techniques of accessing and selecting information via the web will have to consider multilingualism.

The Human Language Technologies could contribute to promoting multilingualism on the Internet thanks to projects conceived for translation and content management.

**1. Multilingual Indexing, Navigation and Editing Extensions for the World Wide Web (MULINEX):**

The MULINEX project is concerned with the efficient use of multilingual online information. Its aim is to process multilingual information and present it to the user in a way which makes finding and evaluating the desired information faster and more accurate. The main goal has been to develop a multilingual Internet search engine that supports selective information access, navigation and browsing in a multilingual environment. The three languages developed initially have been German, French and English. During the document-gathering phase, the web spider analyses documents in order to obtain useful information about documents in addition to the traditional keyword-based indices. The project emphasises a user-friendly interface, which supports the user by presenting search results along with information about language, thematic category, automatically generated summaries, and allows the user to sort results by multiple criteria. Commercial machine translation technology is used to provide translations of foreign-language documents on demand.

**2. Multilingual Digital Culture Web Project (MUDICU):**

the purpose of this project is to analyse the theoretical and practical items related to the development of a multilingual web site. The principal question addressed by MUDICU will therefore be: *Apart from text translation - what else do you need for creating a successful multilingual website?* The aim is come up with a methodology for conceiving and developing multilingual sites devoted to digital culture. The project proposes to study the cultural specificity of such parameters as: colour, music, sounds, navigation buttons,

<sup>2</sup> Source: www.computerworld.com

icons, symbols, backgrounds, images, layout and their role on the cultural/linguistic localisation of web sites.

3. **Multilingual Web search service for the medical community (WEBLING):** It will create a novel pilot search service for the medical community supporting initially four languages (English, French, German and Spanish) and could be expanded to more languages in the future. An intuitive graphical interface will fix together all the components with on-line medical directories to provide a comprehensive multilingual search and translation service. WEBLING will create a number of individually exploitable results: automatic recognition of the natural languages used in the document; automatic classification of the document, e.g. heart disease; automatic recognition and indexing of word and phrase 'variants' under the base form; refinement modules that enable the user to easily narrow the search; on-line subject-specific mono-lingual and bi-lingual dictionaries.
4. **Multilingual Content for Flexible Format Internet Services (MEMPHIS):** the MEMPHIS concept is to develop a toolkit for providing cross-lingual on-demand services. The services will be delivered to phones, PDAs, etc. MEMPHIS aims to deliver not only the toolkit but to demonstrate the operation of two multilingual services using the project technology. The service registration, billing, profile set-up etc will be fixed into a public web site for easy access. The project results will be evaluated by user trials towards the end of the project and implemented in several EU countries.
5. **Wider dissemination and application of terminological research in minority languages in the area of new technologies (DART):** The project aims to build a browser tailored for minority languages based on an already existing software package. It aims to use specific terminological databases and to establish procedures for the use of the browser in a number of lesser-used languages. The terminology produced will be made available via an on-line multilingual database. DART will result in a multilingual web browser specifically created for use by minority languages not currently catered for by the mainstream commercial browsers. Additionally, the project will establish and test a European software localisation model for minority languages applicable to other products and other minority languages in the future.

Other projects aim to provide the countries of Eastern Europe with accurate computerised translation systems:

1. **Machine Translation Systems for the use of Czech, Hungarian and Polish Administrations (MATCHPAD):** this program aims to develop quality machine translation systems from English into Hungarian and Polish, and from Hungarian and Polish into French. The systems will facilitate communication between official bodies of the EU Member States and the Hungarian and Polish administrations and help to prepare their integration. An additional aim of MATCHPAD is to stimulate the development and linguistic customisation of products and services, which satisfy the needs of users in additional geographic markets. The work is being carried out in co-operation with French, Hungarian and Polish Universities, who are developing a new family of analyses and syntax for the Slavic languages. This is particularly important because Finno-Ugric (Hungarian) and Slavic (Polish) languages have more complicated structures than many languages covered by existing MT systems. The new language pairings are being developed and will be demonstrated in public administration environments in Poland and Hungary. Their aim will be to facilitate communication between administrations, businesses and citizens. The project started in 2000, assembling and training the multilingual, multinational and multi-experience research team.
2. **SpeechDat-E:** The project is focused on Spoken Language Resources, namely speech databases for fixed telephone networks including associated annotations and pronunciation lexica. The design is based on a 1000 - 2500 speaker sample balanced for sex, age and dialect. This aims to cover Russian with a 2500 speaker sample and Czech, Slovak, Polish and Hungarian with 1000 speaker samples. These databases will serve as an important resource for the performance of voice-driven teleservice systems.

#### ***Human Language Technologies and Internet: promoting natural interactivity for digital interface use***

The second major HLT challenge is enhancing the naturalness of human-computer interactions and the effectiveness of interpersonal communications by developing tools and systems that enhance the naturalness and equality of access to digital services and devices of all kinds.

It could be said that creating web sites is not complicated, but what it is really difficult is creating sites that truly meet the needs and expectations of a wide range of online users: there will be 10 million sites on the Web by January 2000 (25 million by the end of the year and 100 million at the end of 2002), so users have more choices than ever. With this overwhelming freedom of choice, Web users exhibit remarkable impatience and insistence on instant gratification. If they can't figure out a web site quickly they leave. Studies of user behaviour on the web find a low tolerance of poorly designed or slow sites: people do not want to wait or to learn how to use a home page, people have to be able to understand the functioning of the site immediately after scanning the home page for a few seconds at most. When people have a positive user experience, they are apt to return when they have a bad user experience, they are likely never to return.

This is the reason why nowadays "usability studies" have assumed greater importance in the Internet economy: **creating a "usable" web site means designing for the way people are**, as opposed to design for the way technology is. Making it easy to learn, making few errors and making it pleasant to use as well.

Human Language Technologies programs will focus on three major themes for promoting natural interactivity for digital interface use:

- **Unconstrained written and spoken input/output:** the goal is to develop interfaces that can handle a range of natural speech and language. This covers such technologies as robust, high-quality speech understanding and synthesis. These technologies should be fully cross-media, i.e. be useable in applications such as e-mail reader, Web browsers and portable information appliances. In addition, certain interfaces should be capable of supporting special needs (i.e. handicaps):

1. **E-Mail Access through the Telephone Using Speech Technology Resources:** the *E-MATTER* project aims to develop a system prototype to allow multilingual access to e-mail through the telephone network. The system will initially aim to operate in Spanish, Catalan, Galician and Basque as well as in English and Spanish. Using the *E-MATTER* system, once an e-mail message has been selected, the system will automatically determine its language, correct misspelling errors and then read the message using a text-to-speech converter in the appropriate language. Additionally, the user will be able to connect to a windows-based interface to allow configuration of profile parameters such as

native language, e-mail filters, etc. The system architecture of *E-MATTER* is such that it can easily be configured to accommodate additional languages.

2. **A Multimedia Multilingual Teaching and Training System for Speech Handicapped Children (SPECO):** The aim of the project is to develop a new audio-visual pronunciation, teaching and training method, and a software system for hearing and speech-handicapped persons to help them to control their speech.

SPECO plans to create a system with a general language-independent database editor and measuring system, which makes it possible to adapt the method to any European language. The construction of such a method would help experts dealing with speech therapy and make speech education and training more efficient

- **Interactive multimodal systems:** the aim is to improve the understanding of messages passed through language and other related communicative acts. The project will address the enhancement of interface capabilities of such interpersonal and group communication technologies as video-conferencing, supporting multimodal features such as gesturing, pointing and lip-reading which can help improve the recognition process and increase the naturalness of the interaction:

1. **Natural Interactivity Tools Engineering (NITE):** addresses the growing need in research and industry for best-practice tools for supporting data annotation, analysis and retrieval. The project proposes to build an integrated best-practice workbench for multi-level annotation and retrieval of natural human-human and human-machine dialogue data. It proposes to use the entire domain of natural interactivity, incorporating best practice coding of gesture and facial expression, video handling tools, cross-modality coding and the extraction of multimodal information.

2. **Interacting with Eyes- Gaze Assisted Access to Information in Multiple Languages (I-EYE):** the overall objective of i-Eye is to enable innovative and more natural forms of human-computer interaction by designing interfaces that utilise gaze-tracking, complemented by speech input in certain cases, systems which respond and react to user eye movements. The results of the project are expected to facilitate human computer interaction by making systems more aware of and more responsive to users. Making systems react to changes in the point of gaze is a

radical change from current practices and the prototype applications will show whether, and under what conditions, the technology can yield more efficient and effective human-computer interfaces.

- **Conversational system:** the aim is to progress from constrained to near-human dialogue in order to develop conversational systems with advanced dialogue capabilities.

### Conclusions

Maintaining linguistic and cultural diversity in the European Union is a key component of the development of the information society in Europe for the benefit of its citizens, its businesses and its public administration.

There is a need to guarantee access to mass media without discrimination on the basis of language or social condition.

In order to create a user-friendly Information Society, the European Parliament has proposed :

- Awareness of **linguistic diversity** in all Community information society programmes
- Economic support to **languages industries** for producing interoperable services based on specific linguistic skills
- Broadly-based consultation on cultural, educational, social and linguistic implications and problems.
- A European model of information society driven by social, cultural and educational concerns and **not dominated by economic and technological interests**
- European Institutions should set an example in the democratic and multilingual development of the information society

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